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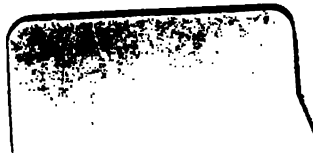
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Labor Shortage
In Track Maintenance

The Remedy

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**LOUIS R. MACDONOUGH,
151 WHALLEY AVE.,
NEW HAVEN, CONN.**

гипотеза

1994

INGERSOLL-RAND COMPANY

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1918

TEACHING AND LEARNING

Copyrighted 1918
INGERSOLL-RAND COMPANY
NEW YORK



This book is dedicated to the man
responsible for the maintenance of track

FOREWORD



AS we write, the press fairly teems with columns of discussion of the problems confronting the railway systems of the country—congestion of traffic; condition of rolling stock; track maintenance and many others too numerous to mention. Throughout it all, however, is one dominant note—Labor Shortage.

Ere these words are done into type, many more columns will have been written, much advice will have been offered, and many of these problems will have approached a satisfactory solution.

The question of shortage of labor, that is, skilled labor, is one that has always confronted every industry, becoming less and less acute as mechanical devices, of one sort and another, have made it possible to utilize more and more the so-termed "green" labor.

The commercial world has long been alive to the possibilities of mechanical inven-

tion; in fact, the story of invention is so intimately associated with the problem of labor, that we have learned to turn naturally to it for a solution even in ordinary times when labor is plentiful.

The salutary effect it always has, either in increasing the productive capacity of the man unit, releasing others for other work, or permitting the utilization of "green" labor is too well known to be dwelt upon here.

Devices which reduce labor and make it possible to employ even the poorest grade are being rapidly introduced by many, and this story has to do with one mechanical device, carrying especial interest for the Maintenance of Way Department of every railroad.

In the presentation of claims for your consideration we have aimed at brevity so as to conserve your time. May we not, however, emphasize the fact, that our entire staff is at your disposal, looking to a remedy for the maintenance of way labor problem.

INGERSOLL-RAND COMPANY.

January 10, 1918.

11 Broadway,
New York.

Four





"Imperial" Compressor Car under its own power, transporting section gang to work. Speed 15 miles per hour.

A Few Press Comments

“**T**HE industries of the country will undoubtedly be forced to operate at high speed for the continuance of the war and as long as these conditions exist the railways will continue to suffer from a shortage of labor and the inefficiency of that which they can secure. The principal relief lies in the substitution of mechanical appliances for men wherever this can be done.”

“A Review of Maintenance
Conditions.”—*Railway Age*.

“There are two reasons for the installation of this large amount of (mechanical) equipment * * * * as a matter of progress and to offset the growing scarcity of all classes of labor.”

E. J. Boland, I. C. R. R.
in *Maintenance of Way Bulletin*.

“The conservation of labor overshadows all other problems in the maintenance of way

department today. 'Railway Maintenance Engineer * * * * announces a Labor Saving Issue for February 1918 * * * * ' Descriptions of labor saving equipment, the field for new devices, the service being rendered by existing devices and labor saving kinks."

Railway Maintenance Engineer.

"The growing scarcity of labor for track maintenance has come to such a pass during recent years as to cause the officials in this department to eagerly seek labor saving devices * * * * * a number of roadmasters who have studied this problem carefully have concluded that the solution to a large extent must be through the use of mechanical appliances. * * * * *"

Railway Review.

" * * machinery must be used to save labor wherever possible, and efficiency in every detail is today a necessity; * * *

We have been advocating labor saving machinery for years; * * * "

From Editorial
—*Maintenance of Way Bulletin.*

" * * The only recourse for the railways is to rearrange their work so as to reduce the

number of men which they require. This can be accomplished most directly by the more general adopting of labor saving equipment. Largely because of the ease with which the necessary number of men have been secured in past years, the maintenance of way department has lagged in the adoption of equipment to replace men, and this substitution has proceeded very slowly. * * *

From Editorial
—*Railway Maintenance Engineer.*

“ * * What is probably the most important innovation in track work is the pneumatic tamper now being introduced. It is now known that machine tamping costs less than one-third as much as hand tamping, and that track tamped with the machine settles approximately one-half as much as track tamped by hand and subjected to the same service.”

New York Times.

QUOTATIONS

FROM RAILROAD MEN



HERE are many, but a few will suffice to indicate the judgment of those who are saving labor with "Imperial" Tie Tampers.

"They have largely made up for the shortage of men * * * * They do vastly better work than can be done by hand tamping and at a substantial saving in cost and are a considerable factor in getting men to and from work where section motor cars are not in use."

N. Y. C. R. R.

Maintenance of Way Bulletin.

"Tamping machine work is far superior to hand work both in quantity and quality."

L. V. R. R.

Maintenance of Way Bulletin.

" * * In all of the large yards where air pipes are installed the pneumatic tie tampers are used. In addition to this, seven portable four-machine air tampers are in use with a view to eventually supplanting manual labor for tie tamping with power. * * * "

L. V. R. R.

Railway Maintenance Engineer.

“These figures are based upon the use of five men and a foreman with each machine and I consider that further economies can be made; in fact we have reduced our gang to four men and a foreman.”

N. Y., N. H. & H. R. R.

Bulletin A. R. E. A.

“Power tools speed up track work—pneumatic asphalt cutting tools and tie tampers, steam shovel and self-propelled concrete mixer called out to solve the labor problem.”

Elmira Water, Light & R. R. Co.

Electric Railway Journal.

“ * * * * * we have been using the four-tool tamping outfit just north of Greenville on our main track and have secured very satisfactory results with same. Figure on asking authority to order one or two more of these outfits in the near future.

* * * * *

Bessemer & Lake Erie Railroad.

The Bessemer & Lake Erie Railroad uses steel cross ties and slag ballast.

Nine

“ * * * One of the members of the Committee took occasion on an annual track inspection to interview a number of Roadmasters who have used mechanical tie tampers and to obtain their opinion of the device. Every one of the Roadmasters who have used the pneumatic tie tampers to a considerable extent are enthusiastic in regard to them, and they consider the mechanical tamper as a coming necessary track appliance where stone ballast is used, both as a matter of economy and for obtaining better results. There does not seem to be any question now as to the superior results obtained from mechanical tamping. On main line sections formerly having an allowance of ten men, they are satisfied that the mechanical tampers would take the place of three men.”

Extract from Report of Ballast Committee, American Railway Engineering Association, January 1917.



Four men removing the car from the track. Time 45 seconds. Cross trucks greatly facilitate this operation.

To Enable You to Judge



WE do not ask that you place your reliance in an untried device. All over this big country of ours, railroads are proving to their own satisfaction that the "Imperial" Tie Tamper will do what is claimed for it and it is from their experience that we ask you to judge its merits.

EXPERIENCE OF THE NEW

YORK CENTRAL (*Engineering News*, March 1916)

" * * * With hand tamping, a foreman and 10 laborers tamped 1 mile of track in $13\frac{1}{2}$ days at \$21.20 per day, or \$282. With the pneumatic machine there was a saving of \$196. In another test the cost was 6.5 cents per tie by hand and 2 cents by machine, or a saving of \$144 per mile (3200 ties). A gang of 40 men (\$61.20 per day) tamped 1 mile of track by hand in 9 days—\$550.80. A gang of 21 men (\$32.13 per day) tamped 1 mile by machine in 13 days—\$417.69, or a saving of \$133.11 per mile. The pneumatic machine tamping was more effective also, the average settlement after 6 mo. being 0.067 ft. for the hand-tamped track and 0.033 ft. for the machine-tamped track."

THE EXPERIENCE OF THE
LACKAWANNA (*Railway Review*, August 1917)

“ * * * * * The work with the pneumatic tampers is also more expeditious than that with hand tools. A test of rate of work and costs by the two methods was made last year, in which the results of the work of five section crews at hand tamping were carefully observed and recorded for a week, as against the average results from the operation of five of the machines in regular operation. The work was in broken stone ballast, and the average cost per tie in hand tamping was 9.2 cents, whereas the average cost per tie tamped with the pneumatic tools was 5.97 cents. In the latter figure the items of fuel, repairs, wages of machine operators and of foremen were taken into account, but not the overhead expense. * * * * * ”

THE EXPERIENCE OF A LARGE
EASTERN RAILROAD

“ * * * * * Track surfaced by machine is more even, is in better surface and stands up much longer than when tamped by hand. One or two illustrations will show what this means. About two miles of track on good sub-grade, on the * * * Division, was tamped by machine and was not re-surfaced afterwards for two years, because there was not a spot in it that needed it. There is a very

bad section of track on the * * * Branch which is very difficult to keep in good condition. They have had a machine on it for two years and with four men in the gang the track is now in good condition, and the Division Engr. states that he knows positively from experience that this could not have been done by hand work.

All the Division Engineers report that where they have very small gangs they can do good work with the machines, while it would be impossible to accomplish much of anything by hand with such a small gang. For instance, on one section of * * * * *, Supervisor * *, used a machine all summer with but two men and a foreman. The compressor was moved once a day with the help of the men from the working train. The track is in very good condition, which would not have been possible if the men had done the work by hand.* * *

* * * * In many cases, * * * * , the machines have attracted a better class of labor, and we have been able to obtain natives who otherwise would not do track work at all. * * *

EXPERIENCE OF A LARGE WESTERN RAILROAD

**“ * * * * * We were able to tamp a
puzzle switch at a cost of \$7.50 as against a
cost of \$21.00 by hand.**

A FEW ADDITIONAL USERS

Santa Fe	Erie
Boston & Albany	Illinois Central
Bessemer & Lake Erie	New York Central
Baltimore & Ohio	New York, N. H. & H. R. R.
New Jersey Central	Pittsburg & Lake Erie
Canadian Pacific	Reading
Chicago North Western	Southern Pacific
Big Four	Virginian
Chesapeake & Ohio	Long Island
Michigan Central	Ontario and Western



The Compressor car on rest furnishing air to "Imperial" Tie Tamper, at work in foreground. The car starts up without delay and requires practically no attendance.

Organization for Two-Tool Tie Tamper Outfit



THE New York Central Railroad (East of Buffalo) restricts itself to the two-tamper outfits. One outfit is assigned permanently to a section. Sections average 12 to 15 miles of single track, that is, a double track section would be 6 miles; a four track section would be 3 miles, etc.

An outfit is used on an average of 100 actual working days per season of 200 days, which leaves the other 100 days or half of the total time for regular section work, other than tamping and surfacing track.

They consider the ideal size of section gang, working with machine outfit, to be seven men and foreman, as compared with twelve men and foreman for hand gang. This, however, varies with the importance of the section, layout of track and density of traffic.

On account, however, of the extreme shortage of labor they have been forced to get

along with much smaller gangs and have been able to obtain very satisfactory results, which would be impossible without machines.

Organization for Four-Tool Tie Tamper Outfit

On the Lackawanna one four-tool tamping machine is assigned to two alternating sections, sections ranging from three to four miles of two main tracks, or an average of seven miles of single main track per machine for a summer working period.

This is on the basis of a four months' period being devoted to the tamping of the ties in connection with the two sections, each section gang raising one-half of its section per summer season, back filling the same with new ballast, placing sufficient ties in the other half of each section to take care of conditions throughout the balance of the season and tamping same. Therefore, one-half of each section will be completely raised and re-ballasted; the other half of each section re-tied from the yearly tie standpoint, and carefully tamped so as to place the entire

section in good condition to pass through the balance of the year. This method would guarantee the re-screening and renovating of one-half of each section every third summer with the regular section force.

The average section gang with machines consists of eight men and a foreman.



An "Imperial" 4-Tool Tamping Outfit at work on a Cross-over of the Central R. R. of N. J. and the Lehigh Valley R. R.

The Air is Available for Many Other Uses



HAVING the tie tamper compressor, air power is immediately available for other classes of maintenance work. Various pneumatic tools may be made a part of the section gang equipment, quickening and facilitating many operations.

For instance, pneumatic drills can be employed for boring holes in ties, running down screw spikes and lag screws, tightening bolts, drilling and reaming holes for rail joints and bonds, and for bridge work as well; pneumatic grinders can be used for grinding rails and switchpoints; pneumatic hammers can be used for driving rivets, chipping and calking in steel culvert, bridge and cattle guard work; pneumatic spike driving hammers may be employed.

Pneumatic rammers are of value for tamping earth around culverts, retaining walls and pipes and for ramming concrete; pneumatic plug drills are available for rock excavation.

The air itself may be applied to n
other special uses, such as mixing and
cing concrete, sand blasting and paint



Top View—Pneumatic Spike Hammer
 Left Center View—Pneumatic Wood Borer
 Right Center View—Pneumatic Screw Spike Driver
 Bottom View—Pneumatic Rail Drill and 'Old Man'

An Outfit Quickly Pays For Itself?

A COMPETITIVE TEST

CONDUCTED ON ONE OF
THE LARGE RAILROADS

HAND *vs.* MACHINE TAMPING (*Four Tamper Gasoline Outfit*)

	Number of Men	Time Hours	Feet of Track Tamped
HAND GANG Foreman	16	8	500
MACHINE GANG Foreman	6	8	528
SAVING	10	TIME 8 HOURS	
			28

	Number of Men	Wages	Expenses Operating- Overhead, etc.	Total
HAND GANG Foreman	16	\$43.50		\$43.50
MACHINE GANG Foreman	6	\$18.50	\$6.95	\$25.45
SAVING	10			\$18.05

SAVING IN FAVOR OF MACHINE TAMPING

In tamping season of 200 days at \$18.05...\$3610.00

Twenty-One

HAND *vs.* MACHINE TAMPING

(Two Tamper Gasoline Outfit)

*****there is an immediate economy in the use of the machines because the work can be done more cheaply. As an illustration, on three sections on *****
* * Supervisor * * had machines with only four men to each gang and with a surfacing lift of from 1" to 1½" they put up from 9 to 11 rails a day. He found that the same number of men working by hand could put up only 5 to 6 rails a day. We have found where we have kept an accurate account of the cost of hand and machine work, that the actual saving is from \$150 to \$200 per mile of track surfaced, and as the machines are generally used for surfacing from three to six miles per season, you will note that this makes a very good return on the machines *****.

Compare these actual performances with the work you are now accomplishing by hand tamping, and it will be evident that the savings effected in the reduction of the size of the section gang and the greater stability and lasting qualities of the work itself will in a short time pay for machine tamping equipment.



An "Imperial" Pneumatic Tie Tamper and the Three Styles of Tamping Bars used with it.

Specifications

"IMPERIAL" PNEUMATIC TIE TAMPER

Weight of machine.....37½ lbs.
Length of machine with bar inserted.....3' 10"
Diameter of air inlet.....½"
Size of hose recommended.....¾"
Best operating air pressure.....65 to 75 lbs.
Air consumption at 70 lbs.
pressure.....16 cu. ft. free air per min.

Tamping Bars for different kinds of ballast can
be furnished as follows:

Rock ballast, 2" mesh, or
larger.....Bar 18" long with ⅝x3" face

Telegraph name, tamper with this
style bar.....rovvd

Rock ballast, finer than 2" mesh, wash gravel
and slag.....Bar 18" long with ⅞x3" face

Telegraph name, tamper with this style bar...rovzg
Cinders, earth, gravel, sand or chat

ballast.....Bar 18" long with 1⅞x3" face
Telegraph name, tamper with this style bar...rowad

Each complete "Imperial" Pneumatic Tamper
consists of one tamping machine with throttle and
connections, one tamping bar and one wrench.
Tampers are always worked in pairs.

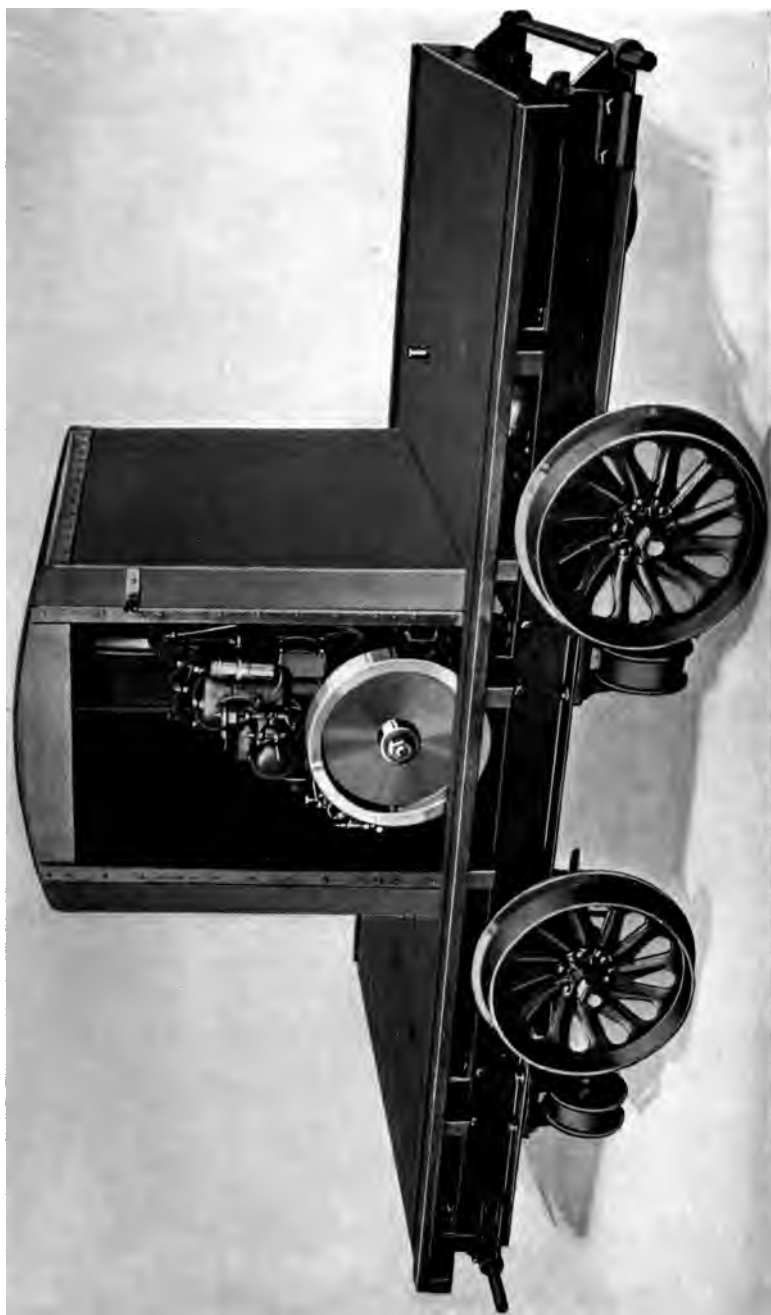
NOTE—In ordering, style of tamping bar wanted
must be specified or the character of ballast must
be given.

HOSE

	Weight	Telegraph Name
25-foot length of $\frac{3}{4}$ ", 7-ply Anti-peel air hose, plain, complete with Bowes couplings.....	37 lbs.	grayfly
50-foot length of $\frac{3}{4}$ ", 7-ply Anti-peel air hose, plain, complete with Bowes couplings.....	58 lbs.	grayhounds
Tee connection with two 12½-foot lengths of $\frac{1}{2}$ ", 7-ply Anti-peel air hose, plain, complete with couplings.....	24 lbs.	grayish

Where hose lines longer than 50 feet are wanted, it is advisable to couple up two or more of the lengths listed above.

2



"Imperial" Gasoline Engine Driven Compressor Car for operating two "Imperial" Tampers. View shows Housing Door dropped.

TWO-TOOL "IMPERIAL" GASOLINE ENGINE DRIVEN COMPRESSOR CAR

Weight complete without hose or tampers..	2,000 lbs.
Weight complete with hose and tampers...	2,372 lbs.
Width.....	5' 7"
Height.....	5' 6"
Length.....	9' 9"
Carrying capacity.....	12 men and equipment
Maximum traveling speed.....	15 miles per hour
Air capacity.....	45 cu. ft. free air piston displacement per minute
Brake horse-power.....	12
Gasoline tank capacity.....	15 gals.
Gasoline consumption, full load...	1¼ gals. per hour
Diameter of wheels, M. C. B. Standard flange and tread.....	20"

Complete equipment consists of the following:

A high-grade gasoline engine complete with carburetor, ignition system, centrifugal speed governor, radiator, water pump and fan. An "Imperial" Vertical single-stage, water-cooled Air Compressor equipped with automatic discharge line unloader, and automatic air valves. Compressor is direct-connected to gasoline engine. Cooling water for cylinder jackets is supplied from the engine radiator. Both engine and compressor are automatically lubricated by means of a splash system.

The engine and compressor are mounted on a specially constructed car equipped with gasoline tank and air receiver. The car is self-propelled through the medium of a lever-controlled clutch on the engine. A powerful set of foot brakes and cross

trucks for quickly moving the car from or onto the track are provided.

A tool box of ample size is a part of the equipment. The entire machinery is enclosed in a suitable, removable housing and a lock is provided to prevent tampering. The car is furnished for U. S. Standard broad gauge, 4 feet 8½ inches. It can be furnished for other gauges when specially ordered.

Each outfit consists of one car, as described above with set of wrenches, two "Imperial" Tie Tamperers fitted with one tamping bar each (style of bar as specified), and 300 feet of ¾-inch, 7-ply "Antipeel" air hose, plain (made up of 50-foot lengths and equipped with Bowes couplings), joined by a tee connection to two 12½-foot lengths of ½-inch air hose with suitable connections for attaching to tampers.

Telegraph name, complete equipment
described above rovki



"Imperial" Gasoline Engine Driven Compressor Car for operating four "Imperial" Tampers. View shows Housing Door dropped.

FOUR-TOOL "IMPERIAL" GASOLINE ENGINE DRIVEN COMPRESSOR CAR

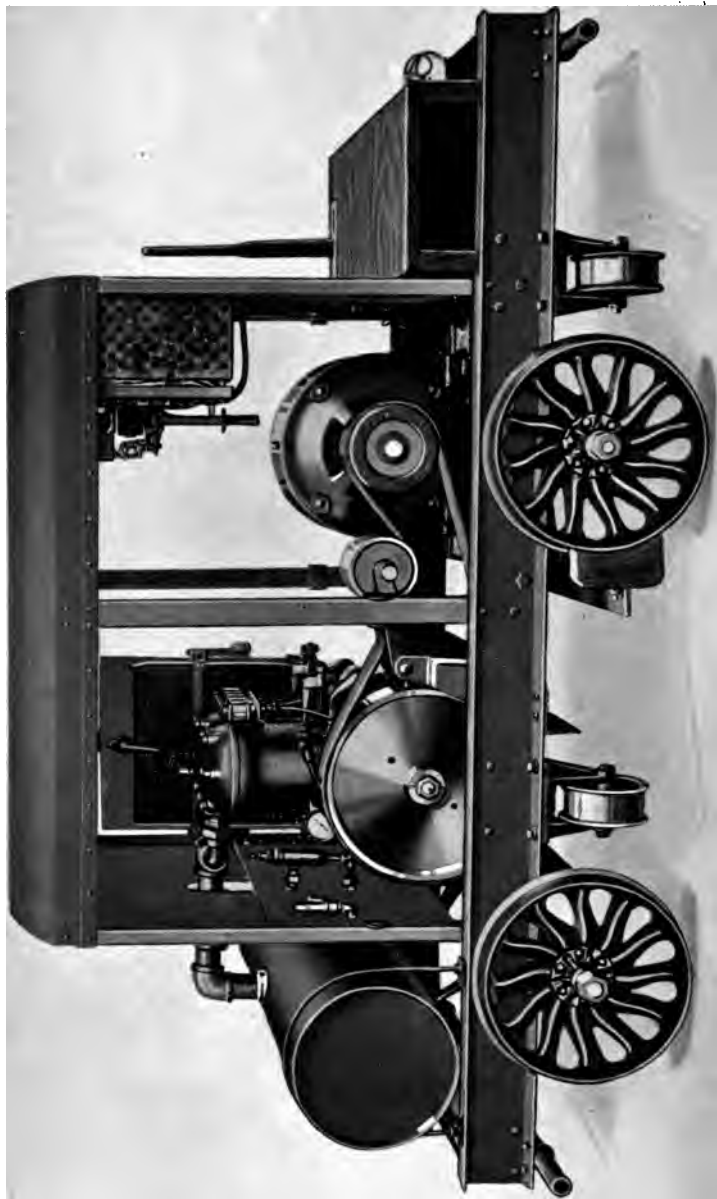
Weight Complete without hose or tampers	3,300 lbs.
Weight Complete with hose and tampers	3,970 lbs.
Width	5' 10"
Height	5' 9"
Length	9' 3"
Carrying capacity	12 men and equipment
Maximum traveling speed	15 miles per hour
Air capacity	88 cu. ft. free air piston displacement per minute
Brake horse-power	20
Gasoline tank capacity	25 gals.
Gasoline consumption, full load	2½ gals. per hour
Diameter of wheels	M. C. B. Standard
flange and tread	20"

Complete equipment consists of items similar to those listed under two-tool gasoline engine driven compressor cars, with the following exceptions: Four "Imperial" Pneumatic Tie Tampers are furnished, each fitted with one tamping bar (style of bar as specified), and two 300-foot hose units of ¾-inch, 7-ply "Antipeel" air hose, plain (made up of 50-foot lengths and equipped with Bowes couplings), each 300-foot length joined by a tee connection to two 12½-foot lengths of ½-inch air hose with suitable connections for attaching to tampers.

In addition, a special set of lifting jacks is furnished with each four-tool car to assist in removing it from the track, and in replacing it.

Telegraph name, complete equipment

described above.....rovme



"Imperial" Electric Motor Driven Compressor Car for operating four "Imperial" Tampers. This view shows Housing Doors removed.

FOUR-TOOL "IMPERIAL" ELECTRIC MOTOR DRIVEN COMPRESSOR CAR

Weight complete without hose or tampers . . . 3,450 lbs.
 Weight complete with hose and tampers . . . 4,120 lbs.
 Width 5' 3"
 Height 5' 6"
 Length 9' 6"
 Air capacity 90 cu. ft. free air piston displacement per minute

Motor horse-power 25
 Direct current, any voltage up to 600

(All other electrical conditions are special)

Complete equipment consists of the following:

An "Imperial" Type XII 5 $\frac{3}{4}$ x5" duplex vertical air compressor, water-cooled and equipped with cooling radiator and fan. The compressor is automatically lubricated by means of a splash system and has automatic air valves. The compressor is connected by short-belt drive with a high-grade electric motor. A hand starter, switch and automatic discharge line unloader are furnished.

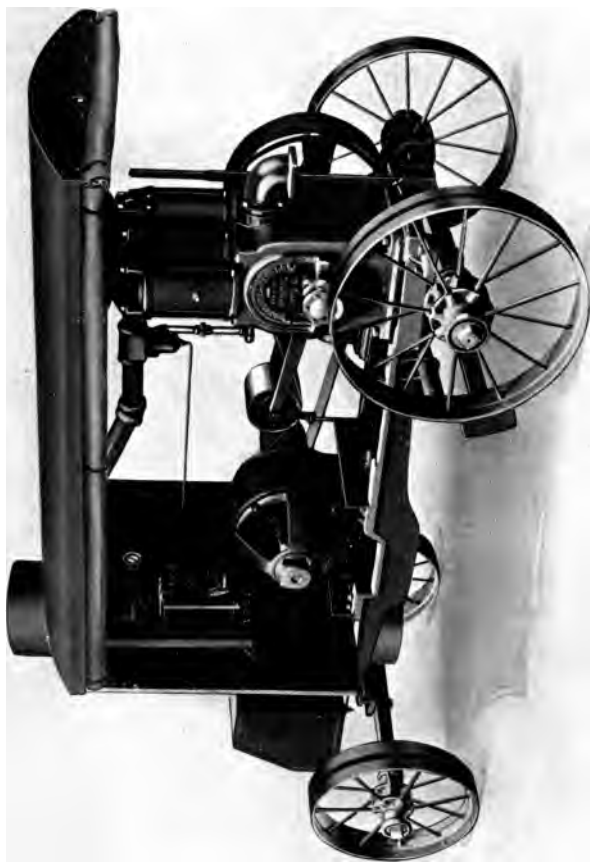
The motor and compressor are mounted on a specially constructed car equipped with air receiver, fitted with safety valve, pressure gauge and drain cock. The car is fitted with a draw-bar socket for coupling to street car, with hand brake and has cross trucks for quickly moving the car from or onto the track.

The entire machinery is enclosed in a suitable removable housing and a lock is provided to prevent tampering.

Each outfit consists of one car as described above with set of wrenches and tool box, four "Imperial" Tie Tampers fitted with one tamping bar each (style of bar as specified), and two 300-foot units of $\frac{3}{4}$ -inch, 7-ply "Antipeel" air hose, plain (made up of 50-foot lengths and equipped with Bowes couplings), each 300-foot length joined by a tee connection to two $12\frac{1}{2}$ -foot lengths of $\frac{1}{2}$ -inch air hose with suitable connections for attaching to tampers.

Telegraph name, complete equipment

described above.....rovsp



"Imperial" Type XII Wagon Portable Compressor Electrically Driven.

